

# Visibility of Contributions and Cost of Information: An Experiment on Public Goods

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## Abstract

We experimentally investigate the impact of visibility of information about contributors on contributions in the public goods game. We systematically consider several treatments that are similar to a wide range of situations in practice. First, we vary the cost of viewing identifiable information about contributors. Second, we vary recognizing all, top or bottom contributors. We find that recognizing all contributors significantly increases contributions relative to the baseline. Recognizing only the top contributors is not significantly different from not recognizing contributors, but recognizing only the bottom contributors is as effective as recognizing all contributors. When viewing information about contributors is costly, there is no significant difference in contributions as compared to the case where all contributors are displayed by default. This effect holds even though the identities of contributors are viewed less than ten percent of the time.

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# 1. Introduction

The desire for social approval suggests that individuals will act more generously in public if their generosity is viewable by others. It has been acknowledged that recognizing contributors by revealing their identity increases contributions to public goods (Andreoni and Petrie, 2004; Rege and Telle, 2004; Anderson et al., 2009).<sup>1</sup> Charity organizations and online communities publicize individuals' contributions for this reason, and very few donations are actually done anonymously (Glazer and Konrad, 1996). However, while information on contributors is often available, the visibility of such information varies. While charity organizations endeavor to publicize all information, this is often difficult to impossible for several reasons. First, when there are many donors, publicizing the names of all of them may not be feasible. In this case, charities often publicize the names of the largest donors, e.g., by naming a building after the highest donor or by publicly announcing donors in categories by size of donation (Harbaugh, 1998; Andreoni and Petrie, 2004; Li and Riyanto, 2009). Second, it is improbable that every member of the donor's social network will view all of the contributor information. For example, in online communities, locating information about individual contributions can take time.

While there is agreement among researchers and practitioners that recognizing contributors has a positive effect, a systematic investigation of the impact of visibility of information on donations has not been conducted. We address this question through a series of controlled laboratory experiments that explore the effect of information visibility on donations. We build our study on the design of Andreoni and Petrie (2004) by investigating a public goods setting with a treatment in which no identifiable information about donors is displayed and a

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<sup>1</sup> Results from psychology literature also suggest that individuals may use information about others' contributions as a reference point to perform social comparisons (Bazerman et al., 1992; Loewenstein et al., 1989; Berkowitz, 1972). It has also been found that announcing a "target contribution," splitting contributions into levels, or allowing a "leader" to contribute first and set an example can increase contributions (Andreoni and Petrie, 2004; Rege and Telle, 2004; Anderson et al., 2009).

treatment in which photos and names of contributors are displayed. We then extend this study with novel treatments that address the effectiveness of several mechanisms that charities and online communities may employ when publicizing contributor information. The first mechanism is to visibly display information only about the top contributors. The second mechanism is to display information about all contributors in a location that is costly to access, for example because it takes time to do so. To pinpoint what type of information is most influential, in a follow-up treatment, we also investigate the impact of visibly displaying information only about lowest contributors.

The first two mechanisms are similar to a wide range of situations in practice. For example, many charity organizations and educational institutions utilize the first mechanism by acknowledging top monetary donors, e.g., naming a university building after a top donor or naming rooms in the building after several top donors. Online communities often acknowledge only the top content contributors by assigning them prestigious titles such as “Mentor” or “Expert.” In this way, less active contributors are not publicly recognized. Organizations that elicit monetary contributions may recognize donors using the second mechanism by publishing lists on websites and in the media, but it is not clear that this information is always viewed by the public due to the time and effort that must be spent in order to view such information.<sup>2</sup> Likewise, users of online communities incur a time and effort cost to view rankings of contributors. For example, on the popular question and answer site *Yahoo! Answers*, a “Leaderboard” announces the total number of answers provided by the contributors of the site, but this information takes

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<sup>2</sup> As an example, see [http://www.pharmacy.purdue.edu/advancement/publications/annual\\_reports/2009/donors.php](http://www.pharmacy.purdue.edu/advancement/publications/annual_reports/2009/donors.php) which is a list of donors to the School of Pharmacy and Pharmaceutical Sciences at Purdue University. The report is difficult to locate online, and the list of donors takes substantial time to read through.

time and effort to view.<sup>3</sup> Similar ranking information is available on the *nanoHUB*, an innovative research community where users are ordered by amount of voluntarily provided content and locating the rankings requires several clicks on the webpage.<sup>4</sup> Empirical studies have noted that online users tend to ignore information that takes time to find; for example, on eBay, buyers rarely click through to view detailed feedback information about sellers (Resnick et al., 2006).

We find that contributions are significantly increased when contributors are recognized (i.e., photos and names of all contributors are displayed after the contribution stage) relative to when contributors are not identified. When viewing information about contributors is costly, there is no significant difference in contributions as compared to the case where all contributors are displayed by default. This effect holds even though the identities of contributors are viewed less than 10% of the time. We are also able to pinpoint which information is most effective at increasing contributions. Recognizing only the top contributors is not significantly different from not recognizing contributors. The most surprising result is that recognizing only the bottom contributors is as effective as recognizing all contributors.

Overall, the results of our experiment provide guidelines for increasing contributions to public goods through changing display of information. The results are relevant for charity organizations, online communities, and policymakers. Our findings suggest that charity organizations and online communities should always post information about contributions, even when it is costly for others to view such information. The results also speak more broadly to policymakers. For example, increasing participation in socially desirable activities, such as

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<sup>3</sup> *Yahoo! Answers* is one of the top sites on which one can find and share information. The “Leaderboard” can be found at [http://answers.yahoo.com/rank\\_total;\\_ylt=AvhvsGIO6\\_Z9A.kmMNpASUrsy6IX;\\_ylv=3](http://answers.yahoo.com/rank_total;_ylt=AvhvsGIO6_Z9A.kmMNpASUrsy6IX;_ylv=3). The “Leaderboard” is only accessible by scrolling down to the bottom of the page, clicking on “About *Yahoo! Answers*”, again scrolling down to the bottom of the page and then clicking on “Leaderboard.” Further, gathering information about individual contributors requires scrolling through several pages of information.

<sup>4</sup> The *nanoHUB* is designed to be a resource to the entire nanotechnology discovery and learning community: <http://www.nanohub.org>

voting or community service, could be achieved by publishing lists of community members who have and have not participated in such activities.

## 2. Public Goods Game

Some of the most fundamental questions about charity contributions have been answered using the public goods game setting in the experimental laboratory (Ledyard, 1995). In a simple linear public goods game (Groves and Ledyard, 1977),  $N$  identical risk-neutral players choose a portion of their endowments  $e$  to contribute to a public good. Player  $i$ 's contribution  $c_i$  to the public good is multiplied by an MPCR  $m \in (0,1)$  and split between  $N$  players in the group. Thus, the payoff for player  $i$  is given by:  $\pi_i = e - c_i + mc_i + m \sum_{j \neq i} c_j$ .

The standard Nash equilibrium prediction of this game is to contribute nothing  $c^* = 0$  (free-ride). However, previous experimental studies have found that subjects contribute significant amounts on average. There is also heterogeneity in contributions: while some subjects contribute their entire endowment, other subjects fully free-ride and contribute nothing (Ledyard, 1995; Fehr and Gächter, 2000). Common arguments for why individuals contribute to public goods include altruism or “warm glow” (Andreoni, 1989, 1990; Ledyard, 1995) and social recognition theory (Glazer and Konrad, 1996). Social recognition concerns may encourage higher contributions only when contributions and identities of contributors are seen by others. Indeed, it has been shown that displaying information about individual contributions to public goods increases contribution levels (Andreoni and Petrie, 2004; Rege and Telle, 2004; Soetevent, 2005). The current experiment builds on the design of Andreoni and Petrie (2004) by systematically varying the visibility of information in a public goods setting.

### 3. Experimental Design

The experiment was conducted at the Vernon Smith Experimental Economics Laboratory. Volunteers were recruited from a pool of undergraduate students at Purdue University. A total of 200 subjects participated in 10 sessions, with 20 subjects participating in each session. All subjects participated in only one session of this study. Some subjects had participated in other economics experiments that were unrelated to this research.

The computerized experimental sessions used z-Tree 3.3.6 (Fischbacher, 2007) to record subject decisions and display photos of subjects. We conducted 5 treatments, summarized in Table 1: a treatment in which contributors were not publicly recognized for their contributions (None-Free), a treatment in which only the highest contributors were recognized for their contributions (Top-Free), a treatment in which only the lowest contributors were recognized for their contributions (Bottom-Free), a treatment in which all contributors were recognized (All-Free), and a treatment in which all contributors were recognized but this information was costly for others to view (All-Costly).

Similar to the design of Andreoni and Petrie (2004), we chose to use digital photos to identify subjects to one another because digital photos capture and preserve the appearance of the person but do not allow for communication, which may confound the effects of identification alone. In addition to the photo, we also included first names written on the name card as part of the identification of subjects. Upon arriving at the lab, each subject wrote his or her first name on a name card, and the experimenter took a photo of the subject holding up the name card. Each subject was then randomly assigned to a computer station in the lab.

Subjects were assigned to a group of 5 in which they stayed throughout the entire experiment, playing a public goods game for a total of 20 periods. At the beginning of each

period, subjects received an endowment of 80 experimental francs and were asked to choose their level of contribution to the public good. Each subject's contribution to the public good was multiplied by  $MPCR = 0.4$  and the total of all contributions given to each of the 5 subjects in the group. Each subject kept the remainder of the 80-franc endowment that he did not allocate to the public good. Subjects did not know others' decisions before making their own decisions. After all subjects made their contributions, the computer displayed the total contribution to the group account and the individual contributions of all 5 group members, sorted from largest to smallest.

The photos and names of each group member were displayed on the input screen for all subjects, but we varied the display of identifiable information about contributors on the outcome screen across treatments. In the None-Free treatment, no additional identifiable information about contributors was revealed. In the All-Free treatment, the names and photos of each member were displayed below his or her contribution, such that each individual was recognized and also "ranked" (see Figure 1). In the Top-Free treatment, the names and photos of only the top two contributors (those ranked #1 and #2) were displayed below their contributions. Similarly, in the Bottom-Free treatment, the names and photos of only the bottom two contributors (those ranked #4 and #5) were displayed below their contributions. Finally, in the All-Costly treatment, after making contribution decisions, and after viewing the default "None-Free" screen with a list of individual contributions but no identification of contributors, subjects had the option to pay a small cost (3 experimental francs) to view the identifiable information about all contributors (as in the All-Free treatment) on the screen. Whether or not information was viewed was not disclosed to subjects during the experiment.

At the end of the experiment, 2 out of 20 periods were selected for payment using a random draw from a bingo cage. Experimental francs were used throughout the experiment, with

a conversion rate of 20 francs = \$1. Subjects earned \$14 on average, and sessions (including instruction time) lasted approximately 60 minutes. Subjects also completed a demographic questionnaire at the end of each session.

## 4. Experiment Results

### 4.1. Overview

The summary statistics are reported in Table 2 and the average contributions over all 20 periods are displayed in Figure 2. Relative to theoretical predictions ( $c^* = 0$ ), we find significant over-contribution in all treatments, with contributions declining over time.<sup>5</sup> Note that as the result of over-contribution, subjects' payoffs are significantly higher than the equilibrium prediction. Our finding of over-contribution is consistent with previous experimental studies, which report that over-contribution is common in public goods environments (Ledyard, 1995). The results from our baseline treatment None-Free are in line with previous work – we find contributions that are at 29.3% of the endowment over all periods. Andreoni (1988, 1995) reported overall contributions at 33.2% of the endowment, while Croson (1996) reported contributions at 35.7% of the endowment.

Similar to Andreoni and Petrie (2004), we find that revealing the identities of contributors in the All-Free treatment significantly increases overall contributions relative to the None-Free treatment.<sup>6</sup> Our baseline treatment None-Free is most similar to Andreoni and Petrie's (2004) "Information" treatment. In our baseline, contributions are equal to 29.3% of the endowment, while Andreoni and Petrie (2004) find that contributions are at 26.9% of the endowment. The

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<sup>5</sup> A t-test, comparing average contributions to 0, gives the p-values of less than 0.05 for all treatments.

<sup>6</sup> A Wilcoxon Mann-Whitney rank-sum test shows that average contributions over all periods in the None-Free treatment are significantly lower than average contributions over all periods in the All-Free treatment (p-value < 0.05). The same conclusion holds when looking at periods 6-20 (p-value < 0.05).



main difference between our treatment All-Free and Andreoni and Petrie’s (2004) “Information-and-Photos” treatment is that we also include the first name of each individual. While Andreoni and Petrie (2004) find that the average percent contributed is 48.1% in “Information-and-Photos,” we find that the average percent of endowment contributed is marginally higher, 55.3%.<sup>7</sup>

**Result 1:** Revealing identities of contributors significantly increases contributions.

In practice, if the charity or online community wishes to display a list of all contributors, due to limited space this is often displayed in a location that takes time and effort to locate and read through. To investigate this issue, in treatment All-Costly, we impose a small cost on individuals who wish to view a list of the identities of all contributors. We do find a significant improvement in contributions in treatment All-Costly relative to treatment None-Free. Moreover, there is no significant difference in contributions between treatment All-Free and treatment All-Costly.<sup>8</sup> This result suggests that the current system in place on websites such as *Yahoo! Answers* and *nanoHUB*, where it takes time and effort to discover the rankings of contributors and where rankings are not viewed often, may not be different from a case where rankings are more visible in terms of increasing contributions. This finding highlights the importance of making identities of all contributions publicly available, even if this information is in a place that is difficult to find.

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<sup>7</sup> We do not claim that this marginal increase in contribution levels is solely due to the addition of the first name component; as other experimental design aspects, for example, ranking the subjects, overall endowment, are also different across our experiment and the experiment of Andreoni and Petrie (2004). A clean test of whether the first name component increases contributions could be achieved by running another treatment of our experiment with the name removed; however, we chose not to do this as this is not the main question of our study.

<sup>8</sup> A Wilcoxon Mann-Whitney rank-sum test shows that average contributions over all periods in the All-Costly treatment are not significantly different from average contributions in the All-Free treatment, but are significantly different from average contributions in the None-Free treatment (p-values 0.47 and 0.00, respectively). The same conclusion holds when we use only periods 6-20 (p-value < 0.05).

**Result 2:** Imposing a cost for viewing identifiable information about contributors does not have a significant effect on contributions as compared to the case when identifiable information is readily available.

In the All-Costly treatment, identities of contributors are viewed by group members less than 10% of the time.<sup>9</sup> The finding that only some subjects are willing to pay a small cost to view a list of the contributors' identities is in line with the recent finding of Eckel and Petrie (2010), who investigate the informational value of a photo in a trust game. Eckel and Petrie (2010) find that even at a very low price, only a fraction of subjects purchase the photos of their matches. However, in the experiment of Eckel and Petrie (2010) subjects purchase the photos before the game begins, while in our experiment subjects "purchase" the photos after each contribution decision is made.

We also attempt to pinpoint which contributors must necessarily be recognized in order to raise contributions. In practice, organizations often rely on displaying only top contributors due to limited space. We find that displaying the identities of only top contributors, as in the Top-Free treatment, increases contributions only marginally, and not significantly different, relative to the baseline treatment None-Free (27.8 versus 23.4).<sup>10</sup> This suggests that displaying only top contributors is not a particularly effective way to increase overall contributions to public goods.

**Result 3:** Displaying the identity of only the top contributors increases contributions only marginally and this difference is not statistically significant.

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<sup>9</sup> With 20 periods and 40 individuals in the All-Free treatment, the number of times photos are viewed is 74/800 (9.2%).

<sup>10</sup> A Wilcoxon Mann-Whitney rank-sum test shows that contributions are not significantly different between None-Free and Top-Free treatments (p-value = 0.35). However, contributions are significantly different between All-Free and Top-Free (p-value < 0.05).

In a follow-up treatment, we display identities of only lowest contributors. While this is not often done in practice, the purpose of this treatment is to investigate whether it is the display of lowest contributors that drives our All-Free/All-Costly and Andreoni and Petrie's (2004) results. In fact, we do find that displaying the identities of only lowest contributors, as in the Bottom-Free treatment, significantly increases contributions relative to both the None-Free and Top-Free treatments (44.9 versus 23.4 and 27.8). Moreover, contributions in the Bottom-Free treatment are similar to contributions in the All-Free treatment (44.9 versus 44.3).<sup>11</sup> This suggests that recognizing only the bottom contributors is as effective as recognizing all contributors.<sup>12</sup>

**Result 4:** Displaying the identity of only the bottom contributors significantly increases contributions relative to the case where no identities are displayed, and is as effective as displaying the identities of all contributors.

## 4.2. Prestige or Shame

While motivations such as altruism and “warm-glow” can explain contributions to public goods when identities are unknown, additional motivations arise when identities are revealed. Previous research has suggested that some individuals may contribute a large proportion of their endowment due to effects such as prestige, while other individuals may contribute a large proportion of their endowment due to effects such as shame from the guilt of contributing too

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<sup>11</sup> A Wilcoxon Mann-Whitney rank-sum test shows that contributions in the Bottom-Free treatment are significantly higher than in the None-Free and Top-Free treatments (both p-values < 0.05). However, contributions are not different between the Bottom-Free and All-Free treatments (p-value = 0.60).

<sup>12</sup> Kurzban and Descoli (2008) report an experiment in which participants could access information about the lowest, median, or highest contribution to the public good before making their own contribution decisions. The authors find that subjects are willing to purchase information on previous-round behavior at a small cost, with reciprocators purchasing information about the median contribution and free-riders purchasing information about the highest contribution. Furthermore, adding a cost to view information decreased aggregate contributions.

little, and that these effects may be amplified when actions are publicly known (Nathanson, 1987; Broucek, 1991; Harbaugh, 1998; Soetevent, 2005). The impact of social pressure has also been documented in the context of voting (Funk, 2010). We conjecture that when all identities are revealed (All-Free), the prestige effect should increase the proportion of high contributors, while the presence of guilt should decrease the proportion of low contributors relative to the baseline (None-Free). When individuals have the option of viewing identities (All-Costly), the prestige and shame effects should not be as strong; therefore, the proportion of high contributors should fall and the proportion of low contributors should increase (relative to All-Free).

In the Top-Free treatment, high contributors are always revealed, but low contributors are never revealed, so high contributions should primarily be driven by prestige. In the Bottom-Free treatment, low contributors are always revealed but high contributors are never revealed, so high contributions should primarily be driven by shame. Because contributions in Top-Free are not statistically significantly different from None-Free, but contributions in Bottom-Free are statistically significantly greater than in None-Free, we conjecture that the effect from identifying contributors may be primarily driven by effects such as shame, rather than by effects such as prestige.<sup>13</sup>

In addition to the “shame” conjecture, another potential explanation for the finding that contributions are increased when only low contributors are identified is that displaying only the bottom contributors serves as an exogenous punishment mechanism for low contributors. It has been shown in the literature that social disapproval (either monetary or non-monetary) is a very powerful mechanism that improves individual contributions to public goods (Fehr and Gächter,

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<sup>13</sup> This result is in line with results of a voting field experiment in which citizens either viewed lists of registered voters or non-voters (Panagopoulos, 2001). This result is supported by theoretical work suggesting that guilt or shame may be a greater motivating factor than altruism or warm-glow (Tadelis, 2007).

2000, 2002; Masclet et al., 2003). Therefore, subjects trying to avoid social disapproval should contribute sufficient amounts in order to avoid being the lowest contributors.

### 4.3. Leaders and Laggards

Similar to Andreoni and Petrie (2004) and Gunnthorsdottir et al. (2001), we investigate the presence of leaders and laggards in our experiment; that is, do we have “leaders” who set an example by contributing a lot, or “laggards” who contribute little? We use a simple classification system to discover “leaders” and “laggards,” where a leader is defined as any individual who contributed 60 or more experimental francs (75% of the endowment) and a laggard is defined as any individual contributed 20 or less experimental francs (25% of the endowment) in the first period.<sup>14</sup> The remainder subjects are classified as followers.

We conjecture that All-Free and All-Costly should increase leaders and decrease laggards relative to None-Free. In the Top-Free treatment, leaders are more likely to be revealed while laggards are less likely to be revealed, so we conjecture that the proportion of leaders should be increased but the proportion of laggards should not change relative to None-Free. In the Bottom-Free treatment, leaders are less likely to be revealed while laggards are more likely to be revealed, so we conjecture that the proportion of leaders should not change while the proportion of laggards should decrease relative to None-Free.

Table 3 shows the distribution of leaders and laggards as a percentage of total number of subjects. Comparing treatment None-Free with All-Free, we find that in treatment All-Free there are almost twice as many leaders (52.5% versus 30.0%), and almost four times fewer laggards

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<sup>14</sup> Andreoni and Petrie (2004) use a similar approach of classifying leaders who contributed 15 or more tokens out of 20 and as laggards as those who contributed 5 or fewer tokens out of 20. However, the difference is that we use only one set of 20 periods while in Andreoni and Petrie (2004), subjects complete 5 sequences of contributions with different group members. In that case, they use the measure for “leaders” as those who contributed 15 or more in 4 out of 5 sequences, and as “laggards” as those who contributed 5 or fewer tokens in 4 out of 5 sequences.

(10.0% versus 35.0%), and these differences are significant.<sup>15</sup> Adding a cost of viewing information does not significantly reduce the number of leaders in the All-Costly relative to the All-Free treatment, but it more than doubles the number of laggards.<sup>16</sup>

If individuals care about prestige of being displayed as one of the top two contributors, we should expect to see a greater number of leaders in the Top-Free relative to the None-Free treatment. However, we do not find this in the data. The proportion of leaders in both treatments is the same.<sup>17</sup> Moreover, Figure 3, which displays the distribution of contributions in all treatments, indicates that there are almost no differences in distributions between treatments None-Free and Top-Free. This finding further supports our earlier conjecture that prestige is not the primary factor that causes higher contributions from identifying contributors.

If individuals are concerned about feeling guilty by being displayed as one of the bottom two contributors, we should expect to see a lower number of laggards in the Bottom-Free relative to the None-Free treatment. This is exactly what our data indicate. There are significantly fewer laggards in the Bottom-Free than in the None-Free treatment (17.5% versus 35.0%).<sup>18</sup> Similar conclusions can be drawn by comparing aggregate distribution of contributions (Figure 3). This finding, therefore, further supports our earlier supposition that the primary factor that causes higher contributions from identifying contributors is shame.<sup>19</sup>

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<sup>15</sup> A Chi<sup>2</sup> goodness of fit test has a p-value of 0.04 when comparing leaders, and a p-value of 0.01 when comparing laggards.

<sup>16</sup> A Chi<sup>2</sup> goodness of fit test has a p-value of 0.66 when comparing leaders and p-value of 0.05 when comparing laggards.

<sup>17</sup> Interestingly, there are more laggards in the Top-Free treatment even compared to the None-Free treatment. This may be because highlighting only the top contributors implicitly emphasizes that the rest of subjects are laggards and thus they should not contribute as much. It is also possible that highlighting only top contributors may implicitly de-emphasize the guilt effect, and thus cause more laggards in the Top-Free treatment relative to the None-Free treatment.

<sup>18</sup> A Chi<sup>2</sup> goodness of fit test has a p-value of 0.08 when comparing laggards.

<sup>19</sup> The proportion of leaders and laggards in the Bottom-Free is not significantly different from the All-Free (p-values are 0.37 and 0.33).

It is also interesting to note that there are more leaders in the Bottom-Free than in the None-Free treatment (42.5% versus 30.0%).<sup>20</sup> It is likely that subjects who are trying to avoid guilt and shame of social disapproval (Masclot et al., 2003) are doing so by contributing very substantial amounts, which brings them into the category of leaders. This provides additional evidence on how effective non-monetary incentives are in encouraging higher contributions to public goods.

## 5. Discussion and Conclusion

The results of our experiment replicate previous findings that revealing identities of contributors significantly increases overall contributions. We also find that recognizing only the top contributors is not significantly different from not recognizing contributors, while recognizing only the bottom contributors is as effective as recognizing all contributors. We also find that imposing a cost for viewing identifiable information about contributors does not have a significant effect on contributions as compared to the case when identifiable information is publicly available. These results provide practical guidelines for increasing contributions to public goods through changing display of information. The findings speak broadly both to charity organizations and online communities, and also to policymakers.

The findings of our experiment have practical applications to online communities, who, similar to charity organizations, can increase contributions through publicly acknowledging members. In online communities and forums, “contributions” usually take the form of user-provided content, which is often necessary to ensure the success of the community. Recognizing contributors is often done by online communities through publicly available rankings with lists

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<sup>20</sup> This difference is not significant, however. A Chi<sup>2</sup> goodness of fit test has a p-value of 0.25 when comparing leaders.

of all contributors or through publicly recognizing only top contributors. There are a number of research studies investigating contributions to various online communities and forums (Rafaeli et al., 2004; Harper et al., 2007; Yang et al., 2008; Adler et al., 2008; Chen et al., 2010; Rana and Hinze, 2004; Farooq et al., 2007; Ludford et al., 2004).<sup>21</sup> We contribute to this literature by providing concrete suggestions for the display and visibility of identifiable contributor information.

The results of our experiment suggest that displaying information about the identities of all contributors, even if this information is not readily available and takes effort to discover, is a very effective way to increase contributions. In fact, the increase in contributions from utilizing this method to recognize contributors is not significantly different from the case in which information about all contributors is readily available and costless to view. On the other hand, the improvement resulting from recognizing only top contributors relative to not recognizing any contributor is only marginal and statistically insignificant. Therefore, the designers of online communities should display all contributor rankings rather than only top rankings.

Because shame appears to be a powerful motivator to contribute, one may ask the question: why don't charities and online communities practice displaying only bottom contributors? While charities and online communities face the problem of increasing contributions, they also face the first-order problem of attracting and retaining participants. Given the opportunity of free entry and exit, individuals may simply avoid participating in

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<sup>21</sup> Separate bodies of work exist on contributions to question and answer sites such as Yahoo! Answers or Google Answers (Rafaeli et al., 2007; Harper et al., 2007; Chen et al., 2010), contributions involving greater effort and expertise to sites such as Taskcn or SourceForge (Yang et al., 2008; Adler et al., 2008; Chatterjee and Pye, 2008), review posting on sites such as Amazon, eBay or MovieLens (Savikhin, 2009; Chen et al., 2010), and use of collaborative online communities to encourage relationships (Rana and Hinze, 2004; Farooq et al., 2007).



charities and online communities that only display bottom contributors. Displaying all contributor information may be an indirect way that such organizations address this issue.

The results can also provide guidelines to increase socially desirable participation and contribution within organizations or communities when entry and exit is more costly. For example, voting in elections is a socially desirable activity whereby citizens must expend time and effort to vote, but all community members benefit from high voter turnout. Policies that prescribe publicizing lists of registered voters who have or have not cast a vote may be an effective approach for increasing voter turnout.

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## Tables and Figures

**Table 1: Summary of Treatments**

Treatment	Display of Identities	Cost of Information	Number of Subjects
None-Free	None	Free	40
All-Free	All players	Free	40
Top-Free	Top 2 players	Free	40
Bottom-Free	Bottom 2 players	Free	40
All-Costly	All players	Costly	40

**Table 2: Average Statistics**

Treatment	Average Contribution	Contribution as % of Endowment	% of Contributions = 0	% of Contributions = Endowment
None-Free	23.4 (0.9)	29.3%	34.4%	8.3%
All-Free	44.2 (1.2)	55.3%	22.0%	32.8%
Top-Free	27.8 (1.0)	34.8%	24.4%	10.9%
Bottom-Free	44.9 (1.0)	56.1%	12.4%	25.1%
All-Costly	39.3 (1.2)	49.1%	33.6%	32.8%






Standard error of the mean in parentheses.

**Table 3: Distribution of Leaders and Laggards**

	None-Free	All-Free	Top-Free	Bottom-Free	All-Costly
Leaders	30.0%	52.5%	30.0%	42.5%	47.5%
Laggards	35.0%	10.0%	32.5%	17.5%	27.5%

**Figure 1: Output Screens (Names and Photos are Removed)**

**Treatment All-Free**

Your Group Members				
You are in a group of the same 5 participants each decision period.				
#1	#2	#3	#4	#5
				
Allocated 80 tokens.	Allocated 58 tokens.	Allocated 10 tokens.	Allocated 5 tokens.	Allocated 2 tokens.

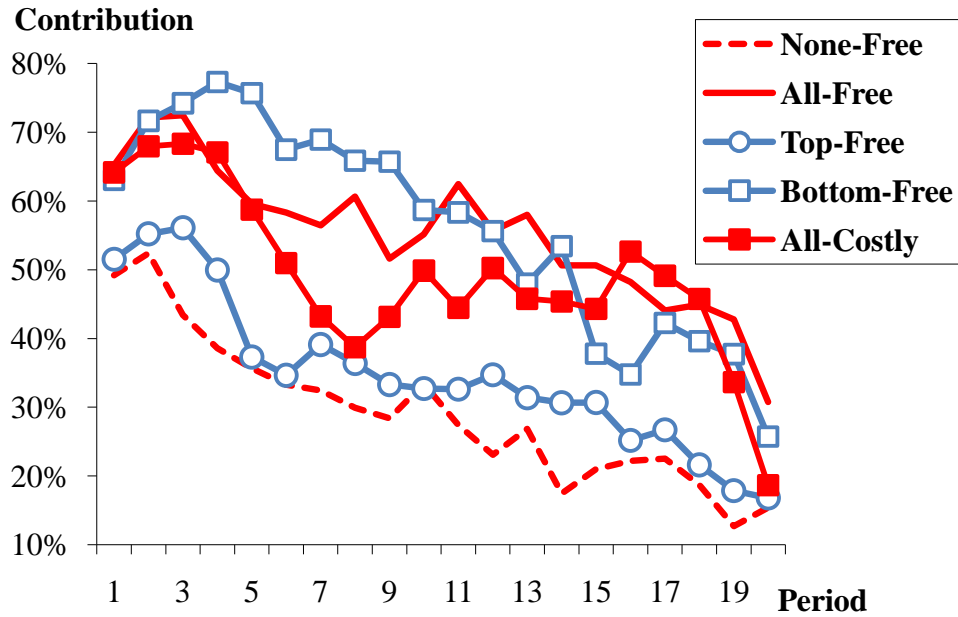
**Treatment Top-Free**

Your Group Members				
You are in a group of the same 5 participants each decision period.				
#1	#2	#3	#4	#5
				
Allocated 80 tokens.	Allocated 58 tokens.	Allocated 10 tokens.	Allocated 5 tokens.	Allocated 2 tokens.

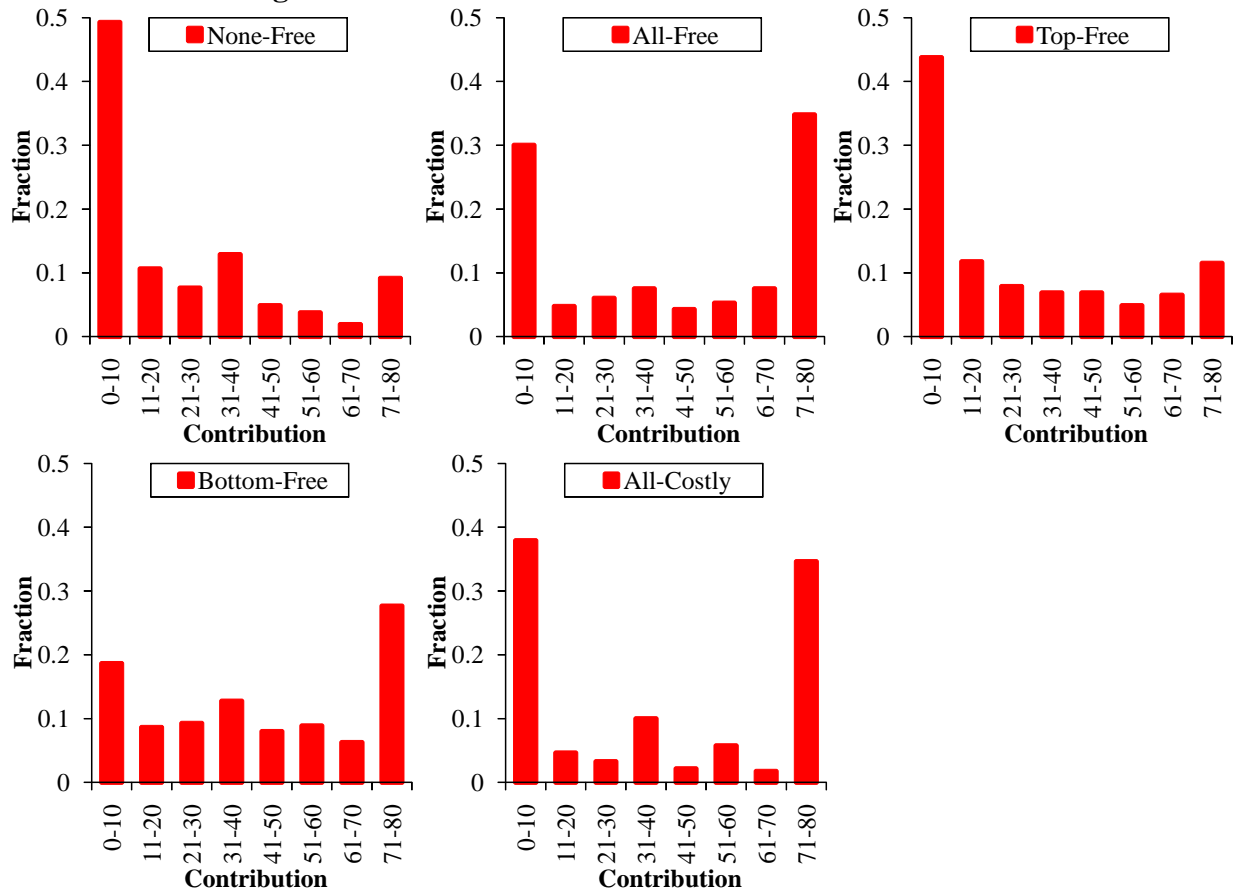
**Treatment None-Free**

Your Group Members				
You are in a group of the same 5 participants each decision period.				
#1	#2	#3	#4	#5
Allocated 80 tokens.	Allocated 23 tokens.	Allocated 12 tokens.	Allocated 2 tokens.	Allocated 2 tokens.

**Figure 2: Average Contribution as Percentage of the Endowment over 20 Periods**



**Figure 3: Distribution of Contributions over 20 Periods**



## Appendix: Instructions for AC Treatment

### INSTRUCTIONS

In this experiment you will be placed in a group of **5 participants** (including you). You will remain in the same group for the entire experiment. The experiment will consist of **20 periods**. At the end of the experiment **2 out of 20** periods will be randomly selected for payment. After you have completed all periods two tokens will be randomly drawn out of a bingo cage containing tokens numbered from **1 to 20**. The token numbers determine which two periods are going to be paid in the game.

Each period you will be given **80 francs**. Francs will be converted to U.S. dollars at the end of the experiment at the rate of **20 francs = \$1**. Each period you will be asked to decide how many francs you want to allocate to a **Group Account**. You may allocate any integer number of francs between **0** and **80**. The remainder will be automatically allocated to your **Individual Account**.

The screenshot shows a web-based interface for an experiment. At the top, it says "Period 3 of 20". Below that, the heading "Your Group Members" is displayed, followed by the text "You are in a group of the same 5 participants each decision period." There are five small video thumbnails arranged in a circle, representing the group members. Below the thumbnails, the heading "Your Decision" is shown, followed by the text "You have 80 francs." and "You may allocate any integer number of francs between 0 and 80." A question "How much would you like to allocate?" is followed by a text input field containing the number "1". At the bottom right, there is a red "SUBMIT" button.

### EARNINGS

After all participants have made their decisions, your earnings for the period are calculated. These earnings will be converted to cash and paid at the end of the experiment if the current period is the period that is randomly chosen for payment. Your earnings consist of two parts:

- 1) Your earnings from the **Individual Account**
- 2) Your earnings from the **Group Account**

Your earnings from the Individual Account equal to the francs that you keep for yourself and do not depend on the decisions of others. Therefore, for **every franc** you keep for yourself in your Individual Account, you earn **1 franc**.

Your earnings from the Group Account depend on the total number of francs allocated to the Group Account by all 5 group members (including you). In particular, your earnings from the Group Account are **40 percent** of the **total allocation of all 5 group members** (including you) to the Group Account. Therefore, for every franc you allocate to the Group Account, you increase the total allocation to the Group Account by 1 franc. Therefore, your earnings from the Group Account rise by  $0.4 \times 1 = 0.4$  francs. And the earnings of the other group members also rise by 0.4 francs each, so that the total earnings of the group from the Group Account rise by 2.4 francs.

In summary, your period earnings are determined as follows:

$$\begin{aligned} \text{Your earnings} &= \text{earnings from the Individual Account} + \text{earnings from the Group Account} = \\ &= 80 - (\text{your allocation to the Group Account}) + 0.4 \times (\text{allocation of 5 group members to the Group Account}) \end{aligned}$$

**Example:** Suppose that you allocated 40 francs to the Group Account and that the other four members of your group allocated a total of 120 francs. This makes a total of 160 francs in the Group Account. In this case each member of the group receives earnings from the Group Account of  $0.4 \times 160 = 64$  francs. In addition, you also receive 40 francs from your Individual Account since you have kept 40 francs to your Individual Account.

## OUTCOME SCREEN

At the end of each period, your allocation and the sum of all allocations in your group are reported on the outcome screen as shown below. To aid you in your calculation, you are also shown your earnings from your individual account and your earnings from the group account. Once the outcome screen is displayed you should record your results for the period on your **Personal Record Sheet** under the appropriate heading.

The photos and names of each member of your group will be displayed on the top of your screen at all times. At the end of each period, the photos of all group members will be re-arranged by the number of francs allocated to the Group Account in that period.

The allocations will be **ranked** from highest allocation to lowest allocation, and the amount of each group member's allocation will be listed on the screen.

## RANKING

Further, each member in the group will be given a **ranking**, corresponding to the number of tokens allocated in that period within the group. For example, the member with the highest allocation in the group will be given the ranking of #1, the group member with the second-highest allocation will be given the ranking of #2, and so on. You have the choice to see the **ranking** of each group member as well as your own **ranking**. If you choose to view the rankings, click on “yes” for the question “Would you like to view the rankings?” If you choose to view the rankings, you will pay 3 experimental dollars, which will be subtracted from your outcome in each period, and the **photo** and **name** of each group member will be listed below his or her ranking on the screen. If you choose not to view the **rankings**, click on “no” for the question “Would you like to view the rankings?” If you do not view the rankings, you will not pay 3 experimental dollars.

Period  
1 of 20

### Your Group Members

You are in a group of the same 5 participants each decision period.

#1	#2	#3	#4	#5
Allocated 88 tokens	Allocated 23 tokens	Allocated 12 tokens	Allocated 2 tokens	Allocated 2 tokens

### Outcome

Your allocation to the Group Account:	2
Sum of all allocations in <b>Your Group</b> :	119
Earnings from your <b>Group</b> Account: $0.4 \times 119 =$	47.6
Earnings from your <b>Individual</b> Account: $1.075 \times$	78.0
<b>Total earnings for this period:</b>	125.6

Would you like to view rankings (with name and photo) of your group members? (Cost to view: 4 experimental dollars)



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